

Monitoring of forest ecosystems (on the example of the Kabardino-Balkarian Republic)

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Abstract. The forest is one of the complex terrestrial ecosystems with landscape-geographic variability. The problem of anthropogenic influence on the environment in general and forest ecosystems in particular is steadily growing. The cause of pollution of all environments with the products of technogenesis, a decrease in biodiversity, a decrease in vegetation cover is most often human activity. The increasing anthropogenic impact on forest ecosystems over the years causes a decrease in their biological resistance and can lead to degradation and even complete destruction. The work studies forest ecosystems of the Kabardino-Balkarian Republic. The main forest-forming rocks of the republic were identified. The age structure of the main forest-forming species has been determined. An analysis of the dynamics of the forest area by completeness, bonite classes was carried out.

1 Introduction

Monitoring of forest ecosystems - a system for monitoring and assessing the state, quantitative and qualitative characteristics of forests changing under the influence of pollution, fires, recreation, pests, forestry and forestry activities.

This type of monitoring is of economic, ecological, environmental, forestry and sanitary and hygienic importance. The need for this area is primarily related to the intensive human impact on the environment, namely on forest ecosystems, the most important of which are large-scale forest exploitation, as well as regional and global atmospheric pollution [1-3].

Forest resources, being part of the natural environment, are necessary for human life. Increasing the anthropogenic impact on forests, reducing the area of forests leads to deformation of the balance of the cycle of matter and energy in nature. In recent years, the sanitary and forest pathological state of many forest ecosystems has rapidly deteriorated.

Kabardino-Balkaria is a mountain republic that is located on the northern slopes of the central part of the Main Caucasus Range. According to the peculiarities of its structure and the nature of the relief, the territory of Kabardino-Balkaria is divided into three parts: plain (33%), foothill (16%) and mountain (51%).

The climate in the republic is diverse. Due to the location in the mountainous area in the republic, the vertical type of zonation. On the plain and in the foothills, a humid continental

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climate is common, which in the mountains changes to a subarctic climate. In the highlands, it transitions to the Alpine climate type [4-5].

The soil cover of Kabardino-Balkaria changes in accordance with natural conditions: climate, relief, vegetation, animal organisms, runoff conditions, features of rocks on which soils were formed, and human economic activity. The different nature of these conditions led to the diversity of soils. Nine main soil types were formed here: dark chestnut, meadow-black earth and meadow soils of the steppes, pre-Caucasian chernozems, mountain-forest, mountain-meadow, alluvial, mountain chernozems, mountain-tundra.

The plant world of Kabardino-Balkaria is very rich. About half of the plant species growing in the entire Caucasus grow here. There are many reasons for this wealth. The territory of the republic has a vertical zonal relief, a variety of climatic and soil conditions. Plants of European forests, West Asian semi-deserts, non-Asian upland deserts penetrate here. In addition, in connection with the peculiarities of the relief and local climates, for a long time, its focus of the formation of endemics was formed - species confined to a strictly defined territory, such as bract poppy, monochromatic decorative primrose Leskenskaya, Nogmova cornflowers, Kabardian snowdrop, trench and Kabardian veneer and others.

The forest zone consists mainly of broad-leaved forests with the participation of coniferous and wild-flowered forest plantations (Fig. 1).



Fig. 1. Coniferous forest in Elbrus region.

All forests of the Kabardino-Balkarian Republic are classified as protective forests, the main purpose of which is not so much in the operational reserves of valuable wood as in their fulfillment of environmental, water protection, protective, recreational and recreational and other environmental functions, as well as in their large biodiversity (more than 50 species). The total area of forest land and land on which forests are located on the territory of the Kabardino-Balkarian Republic, in accordance with the State Forest Register as of 01.01.2022, is 323.1 thousand hectares, of which land covered with forest is 192.0 thousand hectares. The total stock of wood at the root is 35.05 million m³ [6-8].

2 Research methodology

Forest ecosystems are some of the most complex ecosystems on Earth. They are characterized by landscape-geographical variability, heterogeneity, different times of processes and different life expectancy of stands.

During monitoring, the contact (ground) method of the study was used. Data on environmental conditions and pollution were collected. The information base of forest

monitoring is the data of the forest register and the annual report on the state and environmental protection of Kabardino-Balkaria [9-10].

3 Study results

As a result of the studies, it was revealed that in the republic the main factors causing the weakening and death of plantations are lesions of mushroom diseases, entomologists, the impact of adverse weather conditions and soil-climatic factors.

The main forest-forming species in the Kabardino-Balkarian Republic are beech, oak, pine, birch, aspen and others (Fig. 2). They occupy more than 97.6% of the land covered with forest vegetation, other tree species (eastern hornbeam, pear, chestnut, walnut, apple tree, etc.) occupy 1.2% of the land, the rest of the area is occupied by shrubs (beresklet, hazel, sea buckthorn, hawthorn, mushmula and others) make up 0.2%.



Fig. 2. Beech East.

Hardwoods occupy 62.4% of the forested land, soft-leaved - 33.5% and coniferous - 1.7%. The largest area and reserve in hardwoods is the eastern beech: in area 64.6% and total mass 76.2%, in softwoods - birch: 46.6% in area and 34.8% in total mass.

In the age structure of the main forest-forming species in the republic, medium-age plantings prevail, occupying 43.8% in area, then ripe and perestroika - 35.9% and henching - 14.72%. Young people account for 5.58%.

An analysis of the dynamics of forest area by completeness, bonite classes and age groups over the past two years has shown that the area of young animals increased most significantly by 1200 hectares. At the same time, the area of the average age decreased by 200 hectares. The area of ripe and perestroika plantings per 300 hectares has also decreased. This is due to the felling of dead plantations as a result of natural disaster (windfall) and forest diseases.

The share of artificially created forest plantations is 26.2% of the area of land covered with forest vegetation.

4 Discussion of results

The areas and reserves of the main forest-forming species have not undergone significant changes, since in the republic the volume of felling did not exceed the volumes of natural annual wood growth.

Reforestation is carried out in the republic. The main method of reforestation on the lands of the forest fund is the creation of forest crops by planting seedlings, seedlings and rooted cuttings.

5 Conclusions

Forestry is an important environmental and forestry measure that ensures an increase in biological diversity, forestry of the territory, a reduction in unproductive lands of the forest fund, involvement in the circulation of low-value lands and protection of them from negative processes of water and wind erosion, an increase in carbon deposition by agroforestry ecosystems, green spaces and woody-shrub vegetation on the lands of urban settlements, transport and water stock.

Saving and increasing forests, their rational use, as well as increasing their productivity is an important task facing the state forest protection and the population of the region.

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